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EDIBLE UTENSIL

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(57) A method for manufacturing an edible utensil, such as a drinking straw or spoon, includes mixing flour, starch and water. The mixture is formed into shape and dried. The drying step includes a microwave drying step. The composition for use in manufacturing the utensil includes 56-65 wt% flour, 3-12 wt% starch and 20-30 wt% water.

CLAIM

1. A method for manufacturing an edible utensil for eating or drinking comprising preparing a doughy mixture including flour, starch and water, forming a shaped article from the doughy mixture and drying the shaped article to form the utensil, said drying including a microwave drying step.

ABSTRACT

A method for manufacturing an edible utensil, such as a drinking straw or spoon, includes mixing flour, starch and water. The mixture is formed into shape and dried. The drying step includes a microwave drying step. The composition for use in manufacturing the utensil includes 56-65 wt% flour, 3-12 wt% starch and 20-30 wt% water.

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

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Invention Title: **EDIBLE UTENSIL**

Details of Associated Provisional Application:

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The following statement is a full description of this invention, including the best method of performing it known to us

EDIBLE UTENSIL

The present invention relates to a composition and a method for preparing edible utensils for eating or drinking. The invention is especially directed towards a composition and method for preparing edible drinking straws.

Drinking straws are commonly manufactured from paper or plastic. Drinking straws are widely used and very large numbers are sold annually in Australia. In most commercial situations, a number of drinking straws are stored in a receptacle within a food or drink serving area and patrons access the receptacle to obtain the desired number of drinking straws. In general, plastic and paper straws ordinarily in use are not separately packaged or wrapped and therefore it is possible for these straws to be contaminated in the receptacle when patrons access the receptacle. Accordingly, they pose considerable health risks by way of transmitting viral or other infections.

Some special paper and plastic straws for hygienic use are wrapped in either paper or plastic. These straws command a premium price in the market-place and this premium price puts them at a disadvantage over ordinary straws.

Plastic drinking straws commonly in use are non-biodegradable and can be fairly and reasonably described as non or unhygienic. They also present a disposal and litter hazard. In an effort to reduce the litter hazard and hazards presented by the lack of biodegradability of drinking straws and other disposable utensils, several attempts have been made to produce utensils and drinking straws from edible, biodegradable materials. For example, in Australian Patent Application No. 25668/92 in the name of David Aung, a composition suitable for forming into shaped articles such as containers, boxes, cups, lids, plates, trays, straws, eating utensils and structural blocks, is described. This composition contains flour, starch and water, with each of the components being present in an amount such that the composition is rigid and stable over a predetermined temperature range. The composition contains 40 to 80% by weight flour, 20 to 60% by weight starch and 15 to 25% by weight water. The flour and starch are obtained from natural cereal sources such as corn, rice, potato, tapioca and wheat. The method described in this

patent application for forming the article comprises preparing a mixture of flour and starch wherein the flour and starch have a uniform particle size and heating and mixing the mixture under sufficient pressure, temperature, and moisture content and for a sufficient period of time such that when the pressure is decreased, the mixture expands to form a composition which when cooled is rigid and stable over a predetermined temperature range. The present applicant is not aware of any products currently available that are made in accordance with this patent application. Indeed, Australian Patent Application No. 25668/92 has lapsed.

Australian Patent Application No. 26074/84 in the name of Brian John Peterson discloses an implement for manually handling food stuffs. This implement is an edible toothpick and it is produced by mixing a base material, forming the base material into an implement shape and baking the base material. The method for producing this implement includes a baking step. South African Patent No. 91/7366 in the name of G.M. Rowe describes a drinking straw made of an edible material. The edible material is based upon chewing gum ingredients, or is rice paper based or glucose based.

It is an object of the present invention to provide a method and a composition for producing utensils for eating or drinking.

In a first aspect, the present invention provides a method for manufacturing an edible utensil for eating or drinking comprising preparing a doughy mixture including flour, starch and water, forming a shaped article from the doughy mixture and drying the shaped article to form the utensil, said drying including a microwave drying step.

The flour used in the present invention is preferably durum wheat flour or a high protein wheat flour with a protein content greater than 12.5%. For convenience, the term "durum wheat flour" will be used throughout this specification to describe the flour component. However, it will be appreciated that the invention is not limited to the use of durum wheat flour only.

The doughy mixture used in the method of the invention may be prepared by mixing durum wheat flour with the starch to form a substantially homogenous

mixture and subsequently adding water to produce a doughy mixture having the desired consistency. The starch added to the mixture is preferably at least partially pre-gelatinised starch.

Durum wheat flour may be added to the mixture such that it comprises about 56 to about 65% by weight of the mixture. The durum wheat flour is preferably milled such that 100% passes through a 100 U.S. sieve mesh. The durum wheat flour may be aged in hygienic conditions prior to use. For example, the durum wheat flour may be aged for a period of 840 hours or more prior to use.

The starch used in the mixture may be obtained from a number of sources. For example, the starch may be potato starch, maize starch, rice starch, or modified waxy maize starch. As mentioned earlier, the starch is preferably at least partially pre-gelatinised by mixing with water and heating and subsequently drying to a lower water content prior to adding to the mixture. The starch may comprise from about 3% to about 12% of the mixture. In this regard, if partially or wholly pre-gelatinised starch is added to the mixture, the pre-gelatinised starch comprises from about 3% to about 12% of the mixture.

Water is added to the mixture in order to produce the desired doughy consistency in the mixture. Too little water will result in the shaped article formed from the mixture being susceptible to crumbling during handling involved in transferring the shaped article to the drying step and in the drying step itself. Too much water will increase the likelihood of the shaped article loosing its shape due to slumping. Preferably, the water content of the doughy mixture falls within the range of 20% to 30% by weight.

A number of other components may also be added to the doughy mixture. One possible further component is high protein flour, such as a high protein wheat flour. The high protein flour may be added in an amount of up to 9% by weight.

Salt (sodium chloride) may be added, if desired. Preferably, salt is added in an amount such that it does not exceed 1% by weight of the mixture.

A number of colouring agents and flavouring agents may also be added to the mixture to enhance the appearance and taste of the utensil. Vanilla flavouring and

malt extract and two suitable components in this regard. The skilled person will appreciate that there are many other such agents that may also be added to the mixture. Typically, only small amounts of colouring and/or flavouring agents are required to be added to the mixture and in general these components would not exceed about 0.5 to about 1% by weight of the mixture.

The doughy mixture is mixed for sufficient time to ensure that the mixture is substantially homogenous. The various components of the mixture may be mixed simultaneously or added sequentially to the mixture. It is preferred that the durum wheat flour and starch are dry mixed before the water is added thereto. Salt, flavouring agents and colouring agents are preferably added after the water has been added to the mixture.

The mixture may be mixed in any conventional mixing apparatus and bread type dough mixers are suitable for this purpose. Other dough mixers may also be used. The skilled person will readily understand which mixers may be used in the present invention and further description of such mixers is not required for a full understanding of this invention.

After mixing, the mixture may optionally be allowed to stand for a period of time that may be up to 300 minutes before passing to the forming step. In other embodiments of the invention, the mixture is immediately passed to the forming step once mixing is completed.

The forming step forms a shaped article from the doughy mixture and it is the shaped article that becomes the utensil after drying. Accordingly, the forming step forms a shaped article that has the shape of the utensil being produced. The forming step may be a pressing, moulding or extruding process, or indeed any other process that results in the formation of the desired shaped article. In a preferred embodiment of the invention, the edible utensil is an edible drinking straw. In this embodiment, the forming step comprises extruding the doughy mixture to form a generally hollow cylindrical article. The extrusion step may be carried out in a conventional macaroni extruder.

After forming the shaped article, it is necessary to dry the shaped article to

produce the utensil. The drying step reduces the water content of the shaped article and produces a utensil that is sufficiently strong to be used.

The drying step includes a microwave drying step in which the shaped article is treated in a microwave dryer. It is preferred that the shaped article has a moisture content of not more than about 20% when it enters the microwave dryer. If the shaped article has a moisture content higher than that, it is preferred that the shaped article is first subjected to a non-microwave drying step, such as an air drying step, to reduce its moisture content to about 20% or less.

It has been found that the microwave drying step is important in producing a utensil, such as a drinking straw, that has sufficient integral strength and does not break or shatter on touch.

The microwave drying step is preferably carried out at a temperature of from 70 to 90°C, more preferably 75 to 85°C, with a relative humidity of 15 to 20%. It has been found that a microwave dryer having a capacity of 2,000 kg.per hour and capable of operating at between 30 kW and 50 kW of microwave power is suitable for use in this invention.

The residence time of the utensils in the microwave dryer preferably ranges from about 8 minutes to about 75 minutes.

After the microwave drying step, it is preferred that the utensils are subjected to a final equalising drying stage with zero heat input, zero air-flow and preferably a temperature of from 20°C to 32°C and a relative humidity of 70 to 80%. After the equalising drying stage, which typically lasts 30 to 60 minutes, preferably about 45 minutes, the utensils have a temperature in the range of 70 to 75°C and a final moisture content of between 10 and 15%, preferably between about 11.4 and about 13.6%.

In an especially preferred embodiment of the present invention, the utensils are separately packaged in their own wrappers. This allows for the utensils to be hygienically wrapped, which prevents contamination from occurring when a large number of unwrapped utensils are used in public places, such as food courts or canteens. The wrapper is preferably made from a biodegradable wrapping material

to minimise the environmental impact of the wrapper.

The present invention also encompasses the composition used in the manufacture of the edible utensil. In a second aspect, the present invention provides a composition for producing an edible utensil for eating or drinking, the composition including from 56 to 65% flour, from 3% to 12% of at least partially pre-gelatinised starch and from 20% to 30% water. All percentages are given as weight percentages. The flour may be durum wheat flour or high protein wheat flour having a protein content greater than 12.5%.

The composition may also contain other ingredients, such as high protein flour, salt, flavouring agents and colouring agents. These components have been discussed in detail in the description of the method of the first aspect of the invention and reference is made back to that section of this specification.

As mentioned earlier, the utensil is preferably an edible drinking straw. The edible drinking straw produced from the composition of the present invention and by the process of the present invention has high integral strength and does not break on touch. The straws can be packaged through proprietary packaging machines without breakage. The straws are functional in that they allow the free flow of all types of liquid therethrough without becoming soggy and that upon completion of the drinking process are completely edible. If the user decides not to eat the straw after use, the straw is completely biodegradable. Furthermore, the straws impart no bad or cross flavours to the liquid being drunk.

The present invention will now be described in further detail with reference to the following examples. All of the examples relate to the production of edible drinking straws. However, the invention may also relate to the production of other utensils, such as knives, forks, spoons, skewers, etc. It will be appreciated that the following examples are provided in order to illustrate the invention and that the invention should not be considered to be limited to be matter disclosed in the examples.

Example 1

Durum wheat flour which has been milled so that 100% of the grind passes

through a 100 U.S. mesh sieve and that which has been left to age in hygienic conditions for not less than 35 days or 840 hours is measured so that by weight it forms not less than 58% and not greater than 65% of the mixture. To this durum flour is added pregelatinised potato starch in proportions not greater than 12% by weight and not less than 5% by weight. The dry durum wheat flour and pregelatinised potato starch are dry mixed thoroughly and approximately 1% sodium chloride is added after approximately 20 minutes mixing. To this dry mix is added town water by weight not to exceed 30%. The mixture is mixed in a bread type dough maker to which is added liquid vanilla flavouring and liquid malt extract not to exceed 0.5% by weight.

The completely mixed mass is then passed to a standard macaroni extruder whereupon the mass is extruded to an internal diameter of 5 mm and a length overall of 210 mm. From the extruder the mix is passed to a conventional macaroni air dryer where the moisture is reduced to around 20% by weight. From the conventional air dryer the product is conveyed to a 2000 Kg per hour microwave dryer operating at between 30 and 50 kW of microwave power. The specially designed macaroni microwave dryer operates with air temperature of 82°C a relative humidity of 15-20% and an average flow rate of 30 metres per minute. There is a final equalising drying stage with zero heat input and zero air flow and a relative humidity of 70-80%. The final straw temperature is approximately 73°C. The straws are allowed to heat equalise for approximately 45 minutes. By correct selection of ingredients and correct operation of the final microwave drying step it has been discovered that the drinking straws have great integral strength and do not break or shatter on touch. It is discovered that the straws can be packaged through a proprietary paper packaging machine without breakage. Upon opening from the package it is discovered that the straws are functional in that they allow free flow of all types of liquid without becoming soggy and that upon completion of the drinking process are completely edible. It is further discovered that the straws impart no bad or cross flavours to the liquid being drunk. The final moisture of the straws upon equalisation of the drying process is between 11.4% and 13.6% by

weight.

The final edible drinking straws produced in accordance with this example are conveyed to a holding hopper from where they are packaged into cylindrical cellulose heat sealed close fitting sleeves. This packaging is applied by standard packing machines of which there are many types available. The special cellulose packaging material is a mixture of normal wood pulp and cotton lintners and rice starch. This cellulose material is not unlike conventional cigarette paper. It is preferred due to its fairly rapid decomposition under both ambient and warm water conditions. For example under hot water of not less than 65°C the cellulose will commence to degrade and dissolve. This indicates a fairly rapid degree of biodegradability potential. The cellulose packing material so far described contains not less than 65% by weight wood pulp, not less than 25% by weight cotton lintners and not less than 5% by weight rice starch.

Example 2

Durum wheat flour which has been milled so that 100% of the grind passes through a 100 U.S. mesh sieve and that which has been left to age in hygienic conditions for not less than 840 hours is measured by weight so that it forms not less than 56% and not greater than 65% of the mixture. To the durum wheat flour is added high protein wheat flour with protein content not less than 13.0% and having been aged for not less than 840 hours, in a proportion not greater than 9% and not less than 4%. To both these types of wheat flour is added pregelatinised wheat starch and pregelatinised modified waxy maize starches in proportion by weight of no more than 5%. The ratio of pregelatinised wheat starch to pregelatinised modified waxy maize starch may be in the order of 2:1. To this mix is added no more than 1% sodium chloride. To the complete mix is added no more than 28% by weight of town water. The mix is mixed by a conventional dough mixer. During this final mix cycle is added liquid vanilla flavouring and liquid malt extract. The completely mixed mass is then passed to a standard macaroni extruder whereupon the mass is extruded to an internal diameter of 5 mm and a length overall of 120 mm. From the extruder the mix is passed to a conventional macaroni air

dryer where the moisture is reduced to around 20% by weight. From the conventional air dryer the product is conveyed to a combined air-microwave dryer operating at between 30 and 50 kW of microwave power. This dryer operates with an air temperature of 82°C, a relative humidity of 15-20% and an average flow rate of 30 metres per minute. There is a final equalising drying stage with zero heat input and zero air flow and a relative humidity of 70 - 80%. The final straw temperature is approximately 73°C. The straws are allowed to heat equalise for approximately 45 minutes.

By the correct selection of ingredients and the correct operation of the final microwave drying step it has been discovered that the drinking straws have great integral strength and do not break or shatter on touch. It is discovered that they can be packaged through a proprietary paper packaging machine without breakage.

Upon opening from the package it is discovered that the straws are functional in that they allow free flow of all types of liquid without becoming soggy and that upon completion of the drinking process the straws are completely edible.

It is further discovered that the straws impart no bad or cross flavours to the liquid being drunk.

The final moisture of the straws upon equalisation of the drying process is between 11.4% and 13.6% by weight.

The edible drinking straws produced in accordance with this example are conveyed to a holding hopper from where they are packaged into cylindrical cellulose heat sealed close fitting sleeves. This packaging is applied by standard packaging machines of which there are many types available. The special cellulose packaging material is a mixture of normal wood pulp and cotton lintners and rice starch. The cellulose material is not unlike conventional cigarette paper. It is preferred due to its fairly rapid decomposition under both ambient and warm conditions. For example under hot water of not less than 65°C the cellulose fibre packaging material will commence to degrade and dissolve. This indicates a fairly rapid degree of biodegradability potential. The cellulose packaging material so far described contains not less than 65% by weight wood pulp, not less than 25% by

weight cotton lintners and not less than 5% by weight rice starch.

Example 3

Rice starch which has been partially pregelatinised in a process involving mixing rice starch in water and potassium chloride and heating to approximately 63°C and holding that temperature for no more than 180 seconds and then drying the so prepared starch to a maximum moisture of 13% by weight, is mixed with potato starch, durum wheat flour, sodium chloride, malt extract and caramel colour and mixed and prepared as now described. Durum wheat flour is prepared by milling so that 100% of the grind passes a 100 U.S. mesh sieve. The durum wheat flour is carefully aged and matured. To not less than 58% of this durum wheat flour is added 3-7% of the rice starch described previously and potato starch, malt extract and sodium chloride and freshly drawn town water so that the total dry contents do not exceed 80% by weight. The mixture is carefully and thoroughly mixed in a conventional dough mixer, the mixture is left to stand for no more than 300 minutes at a temperature no less than 15°C and no greater than 35°C, the mixture is then passed to a standard macaroni extruder and the mass is extruded to a diameter of not less than 5 mm and a uniform length of 210 mm.

Once the extruded pieces so described exit the extruder they are conveyed directly to a conventional macaroni air dryer and dried to a final moisture of not greater than 15% by weight. The dried straws are then microwave dryer treated in an oven operating at between 30 and 50 kW of microwave power. In this dryer the air temperature does not exceed 82°C and a relative humidity of between 15 and 20% is employed. The straws are dried in this manner to a final moisture of not greater than 11% by weight. These straws are then packaged into biodegradable cellulose sleeves.

The method and composition of the present invention allow for the production of utensils, particularly drinking straws, that are edible. This opens the possibility of the user of the utensil eating the utensil after finishing use of the utensil. This obviously reduces the potential for litter associated with disposable utensils. Alternatively, if the user does not eat the utensil, the utensil is readily biodegradable,

which reduces the litter and environmental hazards associated with disposable utensils. The utensils are sufficiently strong to allow packaging in proprietary packaging machines and this has the potential to reduce the health risks associated with the use of unwrapped utensils. The packaging material used to wrap the utensils may be biodegradable to further reduce the litter and environmental hazard associated with such utensils.

The present applicants have discovered that by the correct choice of ingredients and by correct microwave drying, a strong, dry edible utensil can be manufactured without the need to cook or bake at high temperatures.

It will be appreciated that the invention described herein is susceptible to variations and modifications other than those specifically described. It is to be understood that the invention encompasses all such variations and modifications that fall within its spirit and scope.

The claims defining the invention are as follows:

1. A method for manufacturing an edible utensil for eating or drinking comprising preparing a doughy mixture including flour, starch and water, forming a shaped article from the doughy mixture and drying the shaped article to form the utensil, said drying including a microwave drying step.

2. A method as claimed in claim 1 wherein said flour comprises durum flour or a high protein wheat flour having a protein content of greater than 12.5%.

3. A method as claimed in claim 1 or claim 2 wherein said flour is added to said mixture such that said flour comprises about 56 to about 65% by weight of said mixture.

4. A method as claimed in any one of claims 1 to 3 wherein said flour is milled such that 100% passes through a 100 U.S. sieve mesh.

5. A method as claimed in any one of claims 1 to 4 wherein said starch comprises about 3% to about 12% by weight of said mixture.

6. A method as claimed in any one of the preceding claims wherein said starch is pre-gelatinised starch.

7. A method as claimed in any one of the preceding claims wherein the starch is selected from the group comprising potato starch, maize starch, rice starch, modified waxy maize starch or mixtures thereof.

8. A method as claimed in any one of the preceding claims wherein said water comprises about 20% to about 30% by weight of said mixture.

9. A method as claimed in any one of the preceding claims wherein the mixture is mixed and allowed to stand for up to 300 minutes before passing to the forming step.

10. A method as claimed in any one of the preceding claims wherein the shaped article has a moisture content of not more than about 20% when it enters the microwave drying step.

11. A method as claimed in claim 10 wherein the drying step includes a non-microwave drying step to reduce the moisture content of the shaped article to not more than about 20% followed by said microwave drying step.

12. A method as claimed in claim 11 wherein the non-microwave drying step comprises air drying.

13. A method as claimed in any one of the preceding claims wherein the microwave drying step is carried out at a temperature of from 70°C to 90°C and relative humidity of 15% to 20%.

14. A method as claimed in any one of the preceding claims wherein the shaped article has a residence time of from about 8 minutes to about 75 minutes in the microwave drying step.

15. A method as claimed in any one of the preceding claims further comprising subjecting the shaped article to a final equalising drying stage after said microwave drying step.

16. A method as claimed in claim 15 wherein the equalising drying stage has zero heat input, zero air flow, a temperature in the range of from 20°C to 32°C and a relative humidity of from 70% to 80%.

17. A method as claimed in any one of the preceding claims wherein the utensil has a final moisture content of between 10 and 15%.

18. A method as claimed in claim 17 wherein the final moisture content is from 11.4% to 13.6%.

19. A method as claimed in any one of the preceding claims wherein the utensil is separately packaged into its own wrapper.

20. A composition for producing an edible utensil for eating or drinking, the composition including from 56 to 65% by weight flour, from 3% to 12% by weight of at least partially pre-gelatinised starch and from 20% to 30% by weight water wherein the composition has been dried by a microwave drying step.

21. A composition as claimed in claim 20 wherein said flour comprises durum wheat flour or a high protein wheat flour having a protein content of greater than 12.5%.

22. A composition as claimed in claim 20 or claim 21 wherein said flour is milled such that 100% passes a 100 US sieve mesh.

23. A composition as claimed in any one of claims 20 to 22 wherein the starch is selected from the group comprising potato starch, maize starch, rice starch, modified waxy maize starch or mixtures thereof.

24. A composition as claimed in any one of claims 20 to 23 further comprising one or more ingredients selected from salt, flavouring agents, colouring agents and preservatives.

25. An edible utensil for eating or drinking formed from a composition according to any one of claims 20 to 24.

26. An edible utensil for eating or drinking produced according to the method as claimed in any one of claims 1 to 19.

27. A utensil as claimed in claim 25 or 26 wherein the edible utensil comprises a drinking straw.

28. A method for manufacturing an edible utensil substantially as hereinbefore described with reference to the Examples.

29. An edible utensil substantially as hereinbefore described with reference to the examples.

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Attorneys for:

EDIBLE TECH PTY LTD

DERWENT-ACC-NO: 1997-298537

DERWENT-WEEK: 199911

TITLE: Edible utensils made by forming and drying a mixture including flour, starch and water - to give biodegradable eating or drinking utensils such as drinking straws.

INVENTOR: CRAWFORD, I; GRANT, J

PATENT-ASSIGNEE: GRANT J[GRANI]

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BASIC-ABSTRACT:

Edible utensils are manufactured by forming and microwave drying a doughy

mixture including flour, starch and water.

USE The utensils are for eating or drinking. They are especially drinking straws.

ADVANTAGE The utensils, if not eaten, are biodegradable.

CHOSEN-DRAWING: Dwg.0/0

TITLE-TERMS: EDIBLE UTENSIL MADE FORMING DRY MIXTURE FLOUR STARCH WATER
BIODEGRADABLE EAT DRINK UTENSIL DRINK STRAW

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